AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

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Batch #31

1. SUBJECT CLASSIFICATION

A. PRIMARY
Serials — Y-AA00-0000-G704

B. SECONDARY
Agriculture--General--Korea Rep.

2. TITLE AND SUBTITLE
Adapting and testing of agricultural simulation models to sector analysis; annual report,1974/1975

3. AUTHOR(S)
(101) Mich.State Univ. Dept of Agr. Economics

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1975	66p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Mich.State

8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publishers, Availability)
(Research summary)

9. ABSTRACT

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-AAB-754	

12. DESCRIPTORS
Korea Rep.
Sector analysis

13. PROJECT NUMBER

14. CONTRACT NUMBER
CSD-2975 Res.

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

ANNUAL REPORT

FOR PERIOD
JULY 1, 1974 - JUNE 30, 1975
OF THE PROJECT ON

ADAPTING AND TESTING OF AGRICULTURAL SIMULATION MODELS TO SECTOR ANALYSIS

Contract AID/csd-2975
U. S. Agency for International Development

Agricultural Sector Analysis and Simulation Projects
Department of Agricultural Economics
Center for International Studies
Michigan State University
East Lansing, Michigan

June 30, 1975

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I. SUMMARY

A. Statistical Information

1. Project Title: Adapting and Testing of Agricultural Simulation Models to Sector Analysis
   Contract No.: AID/csd-2975
2. Project Director: George E. Rossmiller, Department of Agricultural Economics, Michigan State University, East Lansing, MI 48824
3. Contract period: 1 July 1971 - 30 June 1976
4. Reporting period: 1 July 1974 - 30 June 1975
5. Total AID funding to date: $1,593,810
6. Total expenditure and obligations through 30 June 1975: $1,143,986
7. Total expenditures and obligations for the reporting period: $391,880

B. Accomplishments and Utilization

Work continued during the report period on the four main areas of project activities--field applications, training program, software library, and methodological and theoretical development.

1. Field Operations--In Korea, Version 2 of the Korean Agricultural Sector Simulation Model was made operational in a 3-region mode and a national mode. Version 2 included the following main components: (1) recursive LP resource allocation components, (2) livestock and crop production component, (3) demand-price component (farm/nonfarm), (4) agricultural foreign trade component, (5) accounting component, and (6) a revised population component. Model parameters including price and income elasticities, yield projections, livestock production coefficients, and population vital rates were reestimated and/or updated. A preliminary set of projections for the Fourth Five-Year Plan including some alternative land and water development strategies were presented to the Economic Planning Board in June 1975. Further tuning and modifications on the model are being carried out.

The national economy component which models the linkage between agriculture and 15 nonagricultural sectors using Bank of Korea input-output data was designed and programmed. The population component was revised to include an internal migration mechanism based on the availability of jobs in the

nonagricultural sector. A yield input-demand component was developed and is being tested. All of these components will be linked to the main model in Version 3.

Most all of the programming of the grain management model was completed during the year. Further tuning and validation was required before the full model could be used for policy analysis. Components of the model were used during the year by the Grains Policy Task Force in making its recommendations on grains price policy for rice, barley, and wheat.

In Nigeria a subcontract with the University of Ibadan for agricultural M. S. thesis research on the kola nut industry continues in effect. Progress is being made but it is difficult to monitor work without being authorized site visits.

Collection of field data for doctoral thesis research on developing a forestry sector model for Nigeria has been completed; write-up of the research is in final stages.

2. Campus-Based Research--A doctoral thesis was completed on "an interactive optimization component for solving parameter and policy decision problems in large dynamic models."

A research paper was completed on further theoretical exploration of the "user cost" problem in economic theory with regard to the investment/disinvestment in durable assets for production.

Thesis research supported in part by the contract was completed on developing a yield/input-demand component for the Korean sector model.

The Michigan Sector Simulation Model (MASS) using components from the software library and the policy analysis language was demonstrated on several occasions. Work on improving the production component was supported in part by the contract.

3. Software Library--Programming was completed on the Policy Analysis Language (PAL), a language which enables a policy-planner who is unfamiliar with using a computer to test alternative policies with a simulation model from a computer terminal. It also facilitates parameter estimation and sensitivity analysis by the model builder during the last stages of model development. The language was used with the Michigan model and the Colombian beef herd model to test and demonstrate its utility.

A generalized PERT analysis package was developed and documented for the software library and applied to analysis of the Korean Crop Improvement Research Project.

Documentation for components in the software library was revised along the lines of the standard suggested by the Policy Advisory Board of the Computer Library for Agricultural Systems Simulation (CLASS).

4. Training Program--Eight trainees participated in the one-year Development Analysis Study Program during its second year of operation under the contract. Emphasis during the program was given to applications of the general system simulation approach to project, program, and policy evaluation formulation and implementation in developing countries particularly with respect to agricultural and rural development.

5. Other Activities--Project staff consulted with various efforts to develop national agricultural sector models for the United States.

Possible collaboration with the International Institute of Applied Systems Analysis in Laxenburg, Austria, is being explored with respect to further work on the software library, a monograph on the national-level modeling of agricultural sectors, and the global modeling of the food/population balance.

Numerous seminars and meetings have been held in the U. S. and abroad to disseminate information about the project to the academic community and potential users.

II. OBJECTIVES AND BACKGROUND

The short-range objective of this project is to adapt and test the application of the "general system simulation approach" to agricultural sector analysis under practical field conditions. The long-range goal is to improve the capability of governments and donor agencies to plan policies, programs, and projects for agricultural development.

Work in further adapting and testing agricultural simulation models to sector analysis was initiated through Contract AID/csd-2975 in July 1971. It followed Contract AID/csd-1557 (initiated in 1967) under which Michigan State University was responsible for developing the general systems simulation approach to sector analysis. Contract AID/csd-2975 along with the Korean Agricultural Sector Analysis Contract (AID/ead-184) has enabled Korean, Nigerian, Colombian and American academic and government personnel to jointly develop, test and adapt simulation models to sector analysis.

As a general problem-solving methodology, the system simulation approach incorporates a number of different perspectives. The basis of the approach takes as a given, a world made up of a hierarchy of systems which can be defined by their boundaries, environments, and interacting parts. The systems analyst starts with defining the needs for a particular real-world system, formulates a problem definition, considers alternative solutions and their feasibility, synthesizes a particular approach or strategy which balances the desire to attain a set of "goods" while avoiding a set of "bads," and implements this approach in the real-world. Work on complex problems such as agricultural sector analysis often is best carried out by a multidisciplinary team which utilizes theory and practical experience from many different fields. Although disciplined nonquantitative thinking is indispensible to conceptualize the overall structure and dimensions of the problem (so-called "mental models"), the emphasis is on the construction of mathematical simulation models. Such models can be run on a computer to analyze many more interactions within the system than can be easily handled by manipulating mental models. "Simulation models" are used to trace out over time the response of variables which measure the performance of the system to different inputs--some controllable by man, others uncontrollable or only partially controllable. These models are often constructed as a set of "building blocks," where each

building block or component can be constructed and tested separately and then linked together to form a model of the larger system. Specialized techniques such as linear programming, input-output analysis, simultaneous equations, regressions, etc. are used where appropriate. Once the analytical model has been validated as a reasonable approximation of the important operating characteristics of the real-world system, then the decision-maker or planner can "experiment" with alternative strategies for improving the system before applying them in the real-world.

Figure 1 shows the perspective of the systems analyst looking at the Korean agricultural sector. The figure indicates the important flows between the agricultural sector and the rest of the economy and the important policy inputs and performance variables. The project team is developing a sector simulation model to address a series of policy questions raised by Korean policy planners and decision makers, particularly as related to formulating the Fourth Five-Year Plan. The project team is also developing a grain management subsector model which will be used for analysis of government policies concerning the pricing, marketing and inporting/exporting of the major grain commodities--rice, barley, wheat.

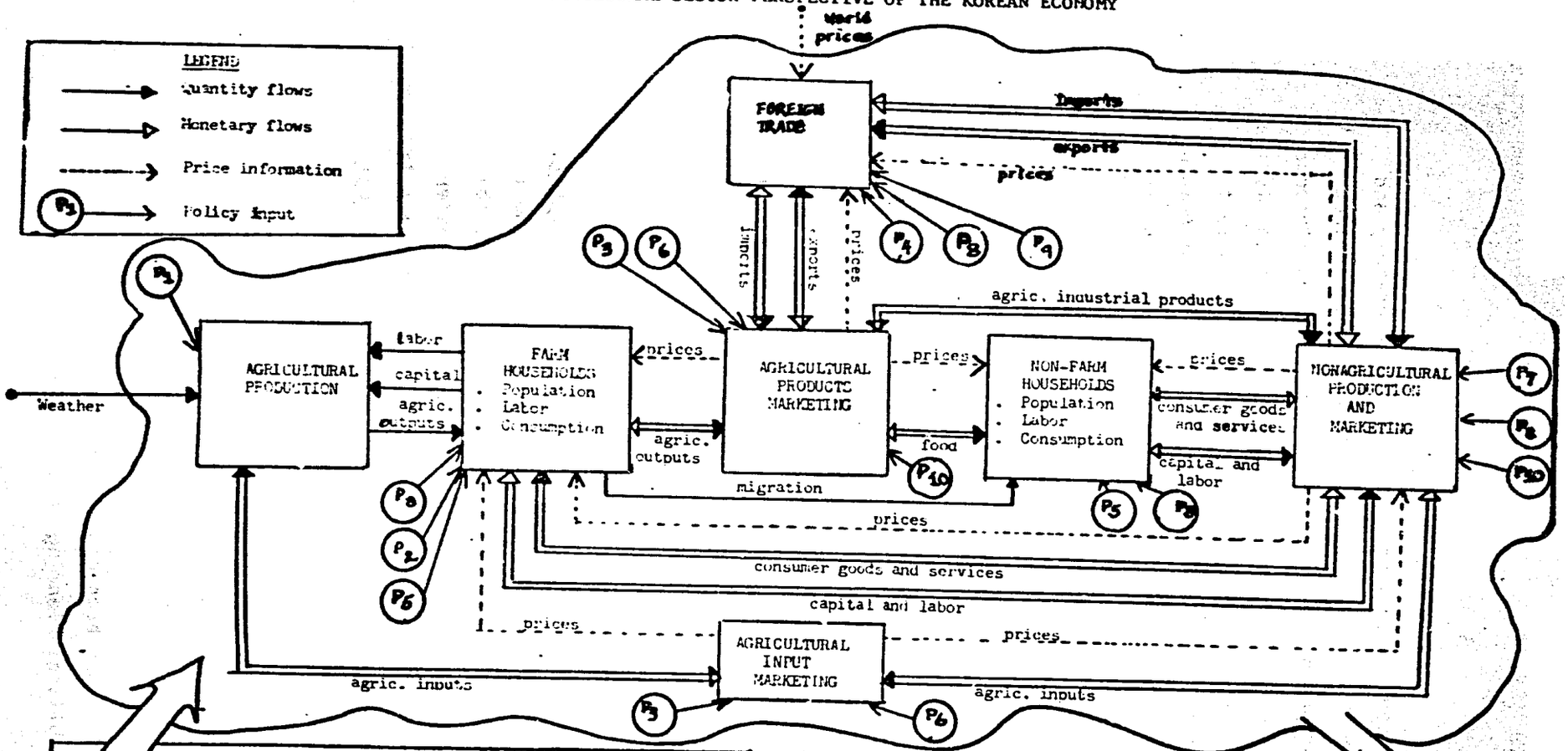
In addition to field applications, there are project activities in three related areas: (a) development and operation of a training program concentrating in support of institutionalizing the approach in both host country decision-making structure and in donor and grantor agencies; (b) development of a software library for easier and more efficient transfer and application of the methodology to a variety of development problems in chosen locations around the world; and (c) methodological and theoretical development, particularly in economics and systems science at both field and campus locations.

Appendix A contains a concise summary of project activities prepared for the Smithsonian Science Information Exchange Program.

During the past year there has been close cooperation between this project and the Korean Agricultural Planning Project (KAPP), another MSU

Figure 1

AN AGRICULTURAL SECTOR PERSPECTIVE OF THE KOREAN ECONOMY



POLICY INSTRUMENTS

P_1	Agricultural development -- land, water, infrastructure, crop improvement, mechanization
P_2	Agricultural Credit
P_3	Price controls and subsidies
P_4	Import/export controls and subsidies
P_5	Population control, health and welfare
P_6	Market improvement
P_7	Rural industrialization
P_8	Tax rates -- income, indirect, customs, etc.
P_9	Monetary -- interest rates, foreign exchange rates
P_{10}	Public consumption and investment

PERFORMANCE INDICATORS

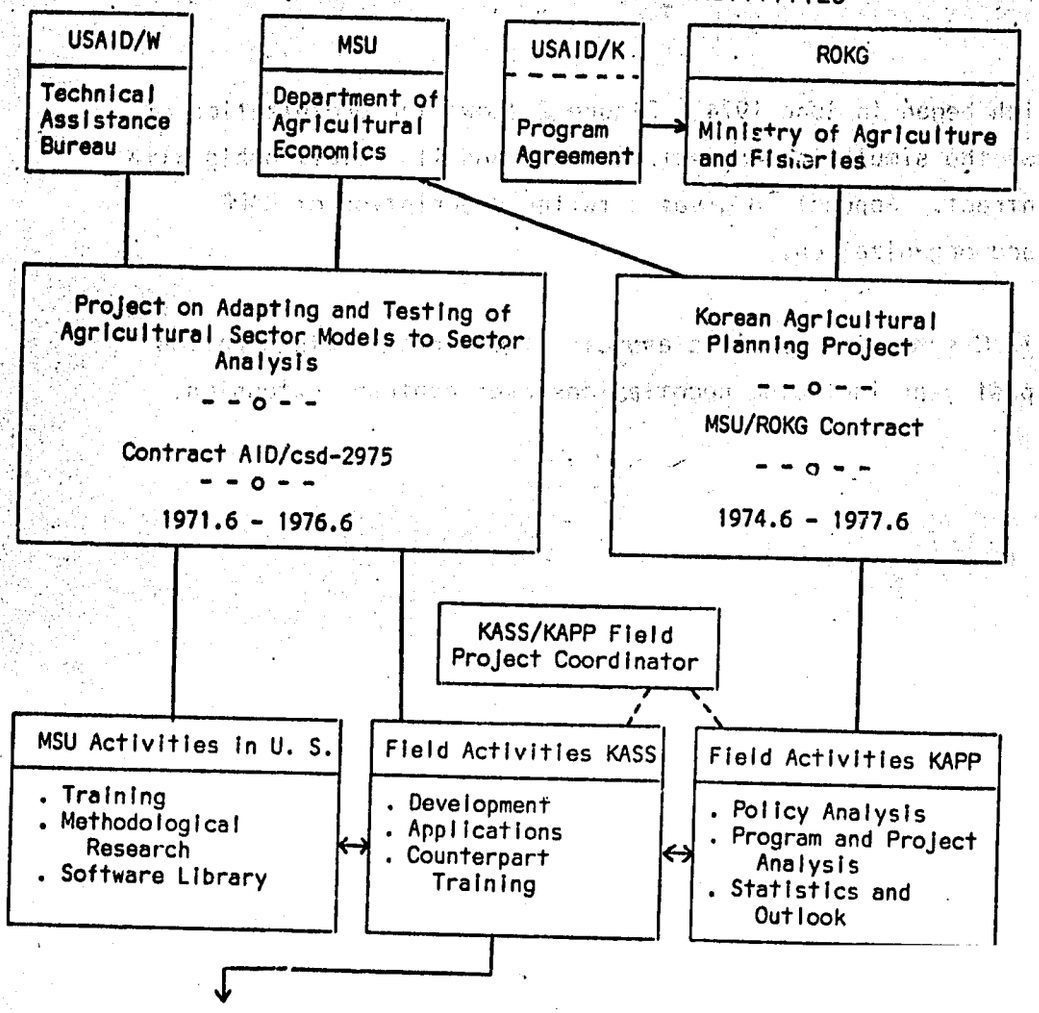
GDP -- total, per capital; nominal, real; agric., nonagric.; growth rate
Income -- total, per capita; nominal, real; agric., nonagric.; farm, non-farm
Trade balance -- exports, imports; agric., related nonagric.
Nutrition
Employment
Tax revenues
Value added
Capital formation
Population
Special accounts status -- e.g., GMSA
Inflation

contract which began in June 1974. Figure 2 shows the organization of activities of the simulation project contract and its relationship with the KAPP contract. Appendix B gives a fuller description of KAPP objectives and organization.

Appendix C summarizes various aspects of contract administration during the past year including negotiations over contract extension.

Figure 2

PROJECT ORGANIZATION AND ACTIVITIES*



KASS COUNTERPART INSTITUTION

Ministry of Agriculture and Fisheries (MAF),
National Agricultural Economics Research Institute (NAERI),
Sector Analysis Division

COMPUTER FACILITIES

Korea Institute of Science and Technology (KIST)
CDC Cyber 70 Computer

National Computer Center
Univac 1108 Computer

CONSULTATION WITH OTHER INSTITUTIONS

Economic Planning Board (EPB)
Korea Development Institute (KDI)
Office of Rural Development (ORD)
Institute of Agricultural Sciences (IAS)
Crop Improvement Research Center (CIRC)
Korea Advanced Institute of Science (KAIS)
Korea Institute of Family Planning (KIFP)

*Including relationship between KASS and KAPP.

NOTE: The field operation is known as KASS--Korean Agricultural Sector Simulation Project or under an earlier contract (AID/ead-184) as the Korean Agricultural Sector Study.

III. ACCOMPLISHMENTS TO DATE

Field Operations in Korea

The major field application effort during the past four years has been in the Republic of Korea in cooperation with the Sector Analysis Division of the National Agricultural Economics Research Institute (NAERI).

During this period work proceeded on the two major modeling efforts--the Korean Agricultural Sector Model (KASM) and the Grain Management Program Model (GMP).

Korean Agricultural Sector Model

Version 2 of the Korean Agricultural Sector Simulation Model was made operational in a 3-region mode (KASM 2R) and a national mode (KASM 2N). Version 2 included the following main components: (1) recursive LP resource allocation components; (2) livestock and crop production component; (3) demand-price component (farm/nonfarm); (4) agricultural foreign trade component; (5) accounting component; and (6) a revised population component (operated as a separate model). Model parameters including price and income elasticities, yield projections, livestock production coefficients, and population vital rates were reestimated and/or updated. A preliminary set of projections for the Fourth Five-Year Plan including some alternative land and water development strategies were presented to the Economic Planning Board in June 1975. Further tuning and modifications on the model are being carried out.

The national economy component which models the linkage between agriculture and 15 nonagricultural sectors using Bank of Korea input-output data was designed and programmed. The population component was revised to include an internal migration mechanism based on the availability of jobs in the nonagricultural sector. A yield input-demand component was developed and is being tested. All of these components will be linked to the main model in Version 3.

Three-region mode (KASM 2R)--During this report period a linked version of the original 3-region sector model operating with the recursive linear programming (RLP) resource allocation component and the market-price

determination component (SEAPA) was made operational on the Univac 1108 computer at the National Computer Center (NCC). Working Paper 74-6, in draft form, by L. D. Teigen describes this version of the model (KASM 2R) and some preliminary policy runs with the model. A 15-year run of the model executes in about 35 minutes of computer time. With this development, a major bottleneck in model development has been broken.

National mode (KASM 2N)--Concurrent with the work at NCC, work was continued to operationalize a linked national version of the sector model including the RLP resource allocation component and the market-price determination component on the CDC Cyber Computer at the Korea Institute of Science and Technology. Operating the sector model in the national mode: (1) greatly reduces the execution time (approximately 3 minutes for a 15-year run); (2) eliminates the extra work of aggregating time series data from the province level to the three regions analyzed in the original KASS Report; (3) produces outputs at the national level, the level of first concern for national decision makers; and (4) allows for testing of the overall design and structure of the sector model (particularly the RLP component) without introducing the complexity of regionalization. Because regional questions are important, however, later versions of the model will provide for "flexible regionalization" allowing analysis at levels of aggregation specified by the researcher.

The national version (KASM 2N) became technically operational in November. The remainder of the report period was spent in making revisions in the model structure and revising and updating model parameters.

Problems in the model performance have been encountered in the areas of price determination, foreign trade policy analysis, determination of the split of barley and potatoes for human consumption and animal feed, accounting of annual labor requirements with increasing levels of mechanization, the rate of pasture land improvement, and production of pulses. In order to correct some of these problems, various changes in the structure of the models were made and tested; some of these changes were considered temporary "quick-fixes" at best. Plans are also being made to add some

new constraints and activities in the RLP resource allocation component: poultry and egg production constraints, a labor mobility activity, redefinition of vegetable activities (traditional/modern to summer/winter), and a working capital constraint.

In addition to the above changes in substantive model structure, the computer printouts were completely revised in order to make them more representative of the model structure in the national mode. A line-printer plotting capability was added which allows the user to specify the grouping and scaling of variables he wishes plotted. The user may also selectively access variables for sensitivity analysis. The computer program itself was "overlayed" (divided up into segments which are called into core memory as needed for execution) in order to reduce the core memory requirements of model operation, thus improving the computer response time and allowing for further expansion of model structure. It also became possible to operate the model from the remote Teletype (Model 38).

Extensive work was also carried out to revise and update the many model parameters. Farm and urban price elasticities were reestimated using extended time-series household survey data. Farm and urban income elasticities were also reestimated using cross-section household survey data (note: time-series data had been used in the estimations of income elasticities in the 1972 KASS Report). Extensive revisions were made in the livestock and feed data input as a result of KASS staff interactions with the MAF Livestock Bureau and NAERI's livestock specialist. Work was started on revising crop input and yield projections through interactions with personnel at Crop Improvement Research Center at the Office of Rural Development.

Population component--KASS Working Paper 74-5 on "Approaches to Modeling Off-Farm Migration" was completed.

Work continued on revising the structure of the population component as recommended in the Craig evaluation report. The most important change was the addition of an internalized off-farm mechanism whereby the overall level of off-farm migration is adjusted to meet the demand for labor in the nonagricultural sectors. The nonagricultural labor demand will be

generated by the NECON component in KASM 3. The cohort survival mechanism was also revised. Other changes were made to simplify the operation of the component and improve the readability and usefulness of the output.

Extensive analysis of the 1960, 1966, and 1970 population censuses and 1960 and 1970 agricultural censuses were made in order to reestimate age-sex specific off-farm migration rate profiles (most of the data analysis work was carried out under a USAID grant to researchers at the Korea Development Institute). Projections of birth rates and death rates were also revised to be consistent with recently published data.

A revised preliminary set of projections for the farm household and nonfarm household populations through 1985 and 2000 were made by the end of the report period for input into the revised KASM 2 projections. A draft of a working paper describing these revisions was begun.

National Economy Component--The national economy component (NECON) models 15 nonagricultural sectors using Bank of Korea input-output data. NECON is composed of seven subcomponents as shown in Figure 3. It will provide feedback linkages between the agricultural sector and the non-agricultural sectors of the Korean economy in Version 3 of the sector model. NECON projections of important national indicators and NECON linkages with KASM are presented in Table 1. By the end of the first half of the report period, the conceptualization, design, and programming of NECON was completed. Two working papers (74-3 and 74-7) which describe the design and structure of the model were written. During the last half of the report period, extensive data collection and analysis was carried out to estimate the numerous parameters required by NECON. Second-iteration modeling and preliminary testing was carried out by a programmer hired under contract from the Korea Institute of Science and Technology. Researchers from the Korea Development Institute (KDI) provided valuable inputs for both the design and data analysis efforts.

Grain Management Program Model (GMP)

During the first half of the year most of the programming of the four major subsector models (as shown in Figure 4) was completed. During

Figure 3

THE KOREAN NATIONAL ECONOMY MODEL (NECON): INTERNAL INTERACTIONS AND INTERACTIONS WITH THE AGRICULTURAL SECTOR MODEL (KASM)

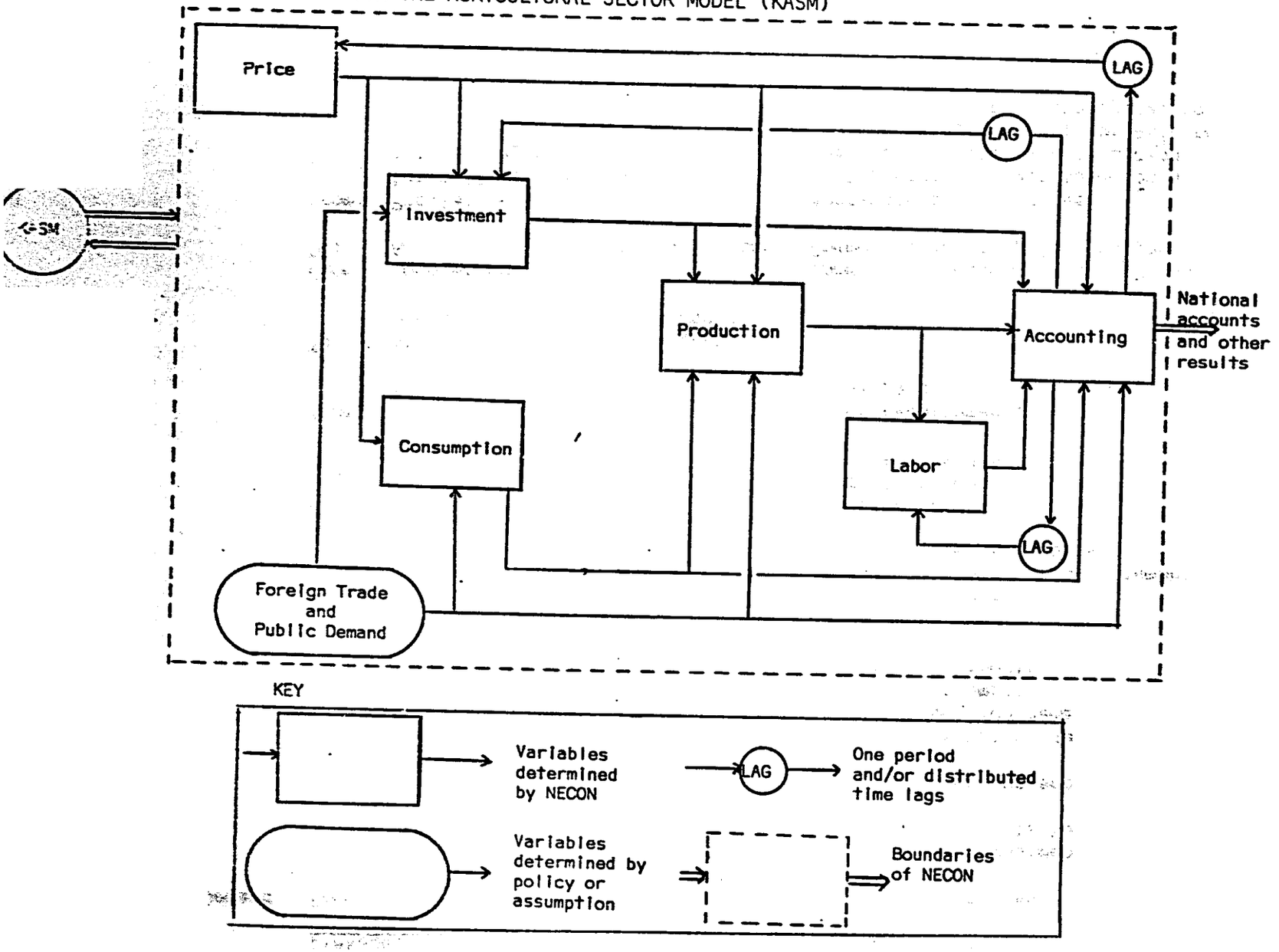


Table 1

NECON LINKAGES WITH KASM AND PROJECTIONS OF IMPORTANT INDICATORS

Subcomponent	Linkages from/to KASM:		Projections of:
Foreign Trade and Public Demand	From:	Agricultural exports Agricultural public consumption Agricultural public investments Agricultural world prices	World price indices Export demands Consumption, investment and intermediate import coefficients based on import substitution policies Public consumption and investment
Consumption	From:	Food imports Aggregate nonfood consumption Food consumption Population	Private consumption demand Total consumption demand Domestic consumption Consumption imports
Investment	From:	Agricultural investment	Private net investment Gross investment Domestic investment goods demand Investment goods imports
Production	From:	Agricultural output Agricultural input demands	Domestic output Production imports Unit value added
Labor	From:	Agricultural labor Agricultural wage labor Agricultural wages	Labor requirements Wages paid
	To:	Nonagricultural labor (lagged) Nonagricultural wages (lagged)	
Price	From:	Food prices	Commodity producer price indices Commodity market price indices
	To:	Agricultural input price indices	
Accounting	From:	Population Agricultural tax revenues	Aggregate price indices Unit profits and variable costs Changes in capacity utilization Income--farm, nonfarm; nominal, real; total, disposable; aggregate, per capita
	To:	Income (lagged)	

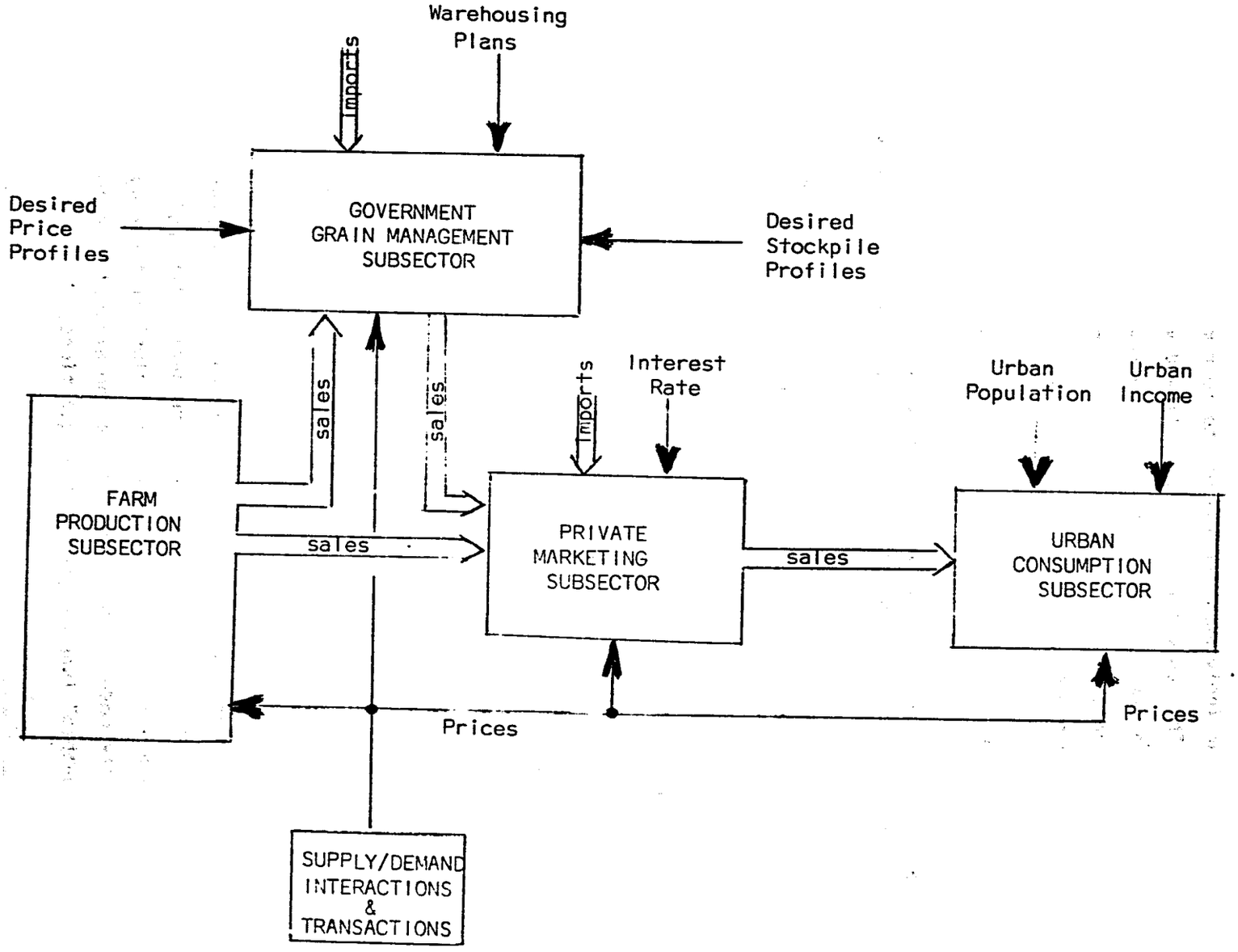


Figure 4. Grain Management Program Simulation Model (General Outline).

the third quarter individual testing of the four major subsector models was completed. The subsector models were linked via the grain marketing transaction mechanism; careful further testing revealed that all subsector models were "technically" operational in this "linked" state. During the remainder of the reporting period work was begun on tuning, validating and documenting the first operational version of the grain management model. This work included:

a) Analyzing empirical time series data of critical model output variables and incorporation of these data series into models for tuning and validation purposes.

b) Reestimating of farm and urban, seasonal and annual demand elasticities using up-to-date data series through the end of 1974.

c) Stabilizing model operation.

d) Checking the consistency of data.

e) Refining the farm marketing structure and estimating relevant parameters.

f) Generating programming procedures for model initialization.

g) Beginning the technical write-up of the model.

Work also proceeded on developing an internalized price generation mechanism which will generate farm and urban private market prices as functions of excess demands. The mechanism will replace the empirical price data series now being used.

When testing and tuning of this price mechanism is completed, it will be possible to input into the model time series data reflecting government grain activities for purposes of historical tracking and validation of the model. These policies can be altered to address "what-if-we-had-done-this" type of grain policy questions.

Grains Policy Task Force

During the first quarter of the report period the sector analysis division of NAERI (KASS) contributed to the Grains Policy Task Force by developing and operationalizing several "mini-models" for investigating:

(a) alternative short-term grain policies for the remainder of the 1974 rice year; and (b) alternative purchase prices for rice in the 1975 rice year. Intensive econometric analysis was carried out on seasonal demand relationships for rice, barley, and wheat flour for rural, urban, and national population groups. Two reports were prepared for MAF policy makers summarizing the conclusions of the task force based on the staff work of KASS/KAPP personnel (see publications list).

In the spring of 1975 MAF asked KASS/KAPP personnel to carry out an analysis of the MAF barley purchase price policy. The significant difference from previous requests for price policy analysis was that MAF requested that the barley price policy be analyzed in coordination with rice and wheat price policies. This approach had been recommended in previous Task Force papers.

MAF Livestock Model

The MAF livestock model was operational at the beginning of this period, but some of the projections differed from those in the MAF report, due to some variations in the methods used to computerize the projections. Further work on livestock modeling is being carried out by one of the Korean training program participants at MSU as his special project.

Computer Operations

By the end of December 1974, all development work on the KASS models had been shifted from the Univac 1108 Computer at the National Computer Center to the CDC Cyber Computer at the Korea Institute of Science and Technology. Operational runs with the 3-region linked version of the model remain at NCC. It is estimated that throughput increased by a factor of 5 to 10 following the changeover. As a result, computer processing ceased to be a major bottleneck on project productivity.

Further steps were taken to strengthen the NAERI computer programming section. Arrangements were made for NAERI to lease an IBM 029 keypunch from IBM Korea, Inc. beginning in March, 1975. The keypunch replaced a vintage model IBM 026 keypunch leased on a temporary basis from IBM Corporation (U. S.) through an interservice support agreement between USAID and the U. S. Army.

In order to improve the organization of the clerical work in the programming section, specially designed file cabinets were acquired to file computer outputs and documentation.

A keypunch operator was hired to punch program decks and updates and to organize and file outputs.

NAERI made arrangements to send several more staff members through the FORTRAN course offered at KIST.

A successful test of the use of the Teletype Model 38 for data communications was made over the local Seoul city lines between NAERI and KIST.

Field Activities in Nigeria

The memorandum of agreement with Professor Samson Olayide and the University of Ibadan remains in force. This memorandum of agreement supports Mr. Cyril Aja in a Master's Degree program of research in the "Development of a Production Model of the Kola Nut Industry in Nigeria." Progress on this memorandum of agreement has been slower than expected. It is extremely difficult to monitor this work without field site visits by MSU personnel. A recent communique from Professor Olayide indicates, however, that Mr. Aja is making progress.

Mr. Felix Nweke completed his field data collection in Nigeria for his thesis. He is developing a forestry sector model for Nigeria and is presently back at MSU in the final stages of thesis writing.

Campus-Based Research

Campus-based research contributed to theoretical and methodological advances in the systems simulation approach and its application to agricultural sector analysis.

Optimal Search Techniques

Marcus Buchner completed his doctoral thesis in system science, entitled "An Interactive Optimization Component for Solving Parameter Estimation and

Policy Decision Problems in Large Dynamic Models." This thesis develops an interactive optimization component, an integrated set of minimization techniques, to assist in the efficient solution parameter estimation and policy decision problems which usually cannot be solved by analytical means in large-scale dynamic simulation models. Particular emphasis was placed upon certain efficiency measures: (1) problem solution accuracy, (2) the number of simulation runs necessary to achieve convergence to the solutions, (3) the interactive capability to change search structure and parameters during the component execution, and (4) computer memory and central processor use.

PERT Analysis

Martin Hanratty completed an analysis of the Korean Crop Breading Project using the Program Evaluation and Review Technique (PERT) (reported in KASS Issue Paper 10 and generalized in Agricultural Economics Report 290). This analysis provided project administrative staff with information pertinent to the planning, scheduling, controlling and evaluation of research activities necessary to attain program goals as stated in the project proposal. Inputs used in the analysis included events or activities expressly mentioned or implied in the project proposal and estimates of activity completion times provided by specialists at Michigan State University and the World Bank. Outputs resulting from the analysis included a network diagram graphically displaying the interrelationships existing between the various project components, an analysis of the float time associated with each project activity and a designation of those activities deemed critical to the completion of the project.

Investment/Disinvestment Theory

Alan Baquet, in consultation with Dr. Glenn Johnson, carried on further exploration of the "user cost" problem in economic theory. Although changes in the levels of durable assets are of primary importance in most simulation studies, there have been few attempts to apply the maximizing principles of economic theory to the analysis of these changes. Thus, there is a need to develop an abstract economic theory of investment and disinvestment as it relates to production in order to lend some economic content to changes in the levels of durable assets. Project Working Paper 75-1 has been written to clarify the abstract maximization theory of economics as it applies to

decisions relating to investments and disinvestments in durable assets. The paper develops an integrated theory of investment and disinvestment analytically linked through the production function. This completion of this working paper fulfills MSU's contract requirement regarding investment/disinvestment research and provides a substantial basis for further work on this problem.

Government Execution and Monitoring Mechanisms

Bo Andersson is researching various mechanisms being utilized by central governments acting through local governments to execute and monitor central government programs to influence producer and consumer behavior. The Saemaul (New Village) Movement in the Republic of Korea is a case in point. His research is also being supported by the University of Uppsala, Sweden.

Livestock Management Model

Mike Jaske, a graduate student in Systems Science, is working with Professor Robert Deans in the Animal Husbandry Department and others on a livestock management model. The project is financed in part by a private industry grant, and Jaske's contribution is provided through an assistantship with the Agricultural Sector Analysis and Simulation Project. The model is designed to be useful in making decisions on whether or not to commit funding to livestock projects; and, if so, it can be used for analytical input into management decisions at the micro level. It is expected that this model will eventually become a part of the software library.

KASM Yield/Input Demand Component

Jeung Han Lee[1] completed a doctoral thesis in agricultural economics entitled "Projections of Product Supply and Factor Demand under Structural Change for Korean Agriculture: A Systems Simulation Approach." A Cobb-Douglas type production function was specified for every crop in each region under consideration with two basic kinds of variables: conventional inputs and structural change variables. The latter shifts the yield function as well as the factor demand function. There are three different structural

[1] J. H. Lee was supported by an ADC Fellowship. Project staff provided consultation with respect to conceptual design and computer programming of his model.

change variables. The first involves biological technology and human change (biological research and extension of its results). The second involves land and water development. And the third is the variable exclusively related to perennial crop production such as tree crop age cohort and residual effect of the conventional inputs used in the past. The first two structural change variables are generated mainly by the public sector. The rate of land improvement was modeled by a high-order differential equation as a function of public investment, among others. The same is true for biological research and dissemination of its results. The existence of indigenous innovation among the leading farmers and by the agribusiness sector is also recognized.

Dr. Lee has returned to Korea, where he is under a consulting contract with NAERI to incorporate his component into Version 3 of the sector model.

Michigan Agricultural Sector Simulation Model (MASS)

In mid-March 1974, interest in the future of the agricultural sector of Michigan by the Michigan Department of Agriculture of the State of Michigan and the Department of Agricultural Economics at MSU provided the opportunity of development of an agricultural sector model which would be complementary to development of the computer library and to other research at MSU.[1] Two dominant goals in the effort to develop the model were: (1) to develop a crude model of Michigan's agricultural sector to evaluate the feasibility and cost of building an extensive model that could be used as a research tool by staff members at Michigan State University, and (2) to provide an assessment of the presently developed capabilities of CLASS and to demonstrate these capabilities. The model structure and parameters were drawn from working papers and publications of an Agricultural Experiment Station project called Michigan 80&5--An Analysis of Michigan's Rural Potential by 1985. This model used seven components of the software library: two demographic components, two table components, two delay components, and an accounting model. The Policy Analysis Language was used with the model to facilitate users' comprehension of the model and to enable their interacting with the model.

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[1]Work was supported in part by Michigan Agricultural Experiment Station.

During the past year, for his Ph.D. dissertation Dave Watt has continued to work on the development of a more detailed production component for the MASS model.

Computer Library for Agricultural Systems Simulation

During the past year the Computer Library for Agricultural Systems Simulation (CLASS) has moved forward in several areas. Various library components have undergone further development and some have been accepted into the library. The documentation standards have been revised along the lines suggested by the Policy Advisory Board at their last meeting in May 1974. All of the components of the library have now been converted to the new form of the documentation.

These components which have been made a permanent part of the software library include six delay routines, four table look-up functions, and two demographic models, one discrete and one continuous. A complex accounting routine is completed and ready for review. The price-quantity adjustment model has been generalized and programmed. Some of the components which have been developed in Korea, including the national economic component and the grain management component, will also be generalized for inclusion in the library.

One of the recommendations that came out of the Policy Advisory Board meeting was to make a comprehensive search of other libraries similar to CLASS which already exist. This was done with the hope that some of their experiences could be applied to our library. A few such libraries were found to exist, though slightly different in scope and content, and some information about them has been gathered.

The major thrust of the past year, however, has been the completion of the Policy Analysis Language (PAL). Although it is not a modeling component, PAL has been included in the library since it is an aid in testing and in making policy runs of simulation models. PAL 2.0 has been developed over the past year and was a redesign of the preliminary version of PAL. The

syntax of the language has been redone to make it easier to use, and considerable power has been added to what PAL can do for both a model builder and a policy analyst.

In its expanded form, PAL serves two basic functions. First, it provides a means for a decision maker who is not familiar with computer technology to access the model, change parameters, and analyze the results. When a decision maker first approaches a model, PAL gives the model builder a way of explaining the model to him by means of the computer. As a decision maker's understanding of the model grows, he becomes less dependent on the explanation provided by the model builder and takes over control of running the model. By using PAL, he can still have the full capabilities of the system without any programming knowledge. Second, PAL eases the job of the model builder during the later stages of model development. The jobs of parameter estimation, sensitivity analysis are simplified and sped up by providing an easy, interactive means of adjusting the model.

PAL has been made completely operational and has been tested with several working models. An effort is now being made to make PAL available to a wider audience and to encourage its use by others. A reference manual has been written for the model builder who uses PAL as well as a brief description of using PAL from a terminal for a policy analyst. A programmer's guide still remains to be written.

The PAL language was used in conjunction with a simulation model of Northern Colombia's Beef Herd[1] to: (1 increase its availability, (2) allow for a more extensive variety of policy runs, and (3) provide a test for implementation of PAL with an operational model.

A computer program has been developed to assist project analysts and students who wish to use critical path analysis as a planning tool in project scheduling and evaluation. The manual which contains a practical explanation of the PERT technique and a listing of a generalized computer program was an

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[1] A Simulation Analysis of Policies for the Northern Colombia Beef Cattle Industry, a Ph.D. thesis written by Alvaro Posada under the contract.

outgrowth of the PERT analysis conducted in evaluating the Korean Crop Breeding Project. The computer algorithm is designed to determine a project's critical path and to equate the time required to perform various project activities with specific calendar dates. The computer programs appearing in the manual are written in FORTRAN IV and are designed to run on the CDC 6500 facility at Michigan State University.

The Policy Advisory Board did not meet during the past year because of lack of funds. The last meeting was held in May 1974.

Development Analysis Study Program

Basic Study Program

During the report period the project staff conducted the Basic Development Analysis Study Program, a one-year program designed to develop professional analytical and modeling capacity for effectively applying modern quantitative methods to problems for project, program, and policy formulation and implementation in developing countries. Emphasis during the program was given to applications in agriculture and rural development, although participants with interests in education, nutrition, health planning and management, and other related areas were welcomed to attend the program. This was the second year that the program was given.

The Basic Study Program is designed for professionals who have at least a bachelor's degree in an appropriate field such as agricultural economics, engineering, economics, mathematics, or statistics. It can be used as a part of a regular master's or doctoral program in an area such as System Science or Agricultural Economics or it can stand alone as a one-year diploma program. The former option is recommended as a norm, but the latter option is available for participants who cannot remain away from their professional positions for more than one year.

The Basic Study Program included formal course work in systems methodology, theory, simulation methods, optimization methods, computer-based

decision analyses, and computer science. Where needed, it also included formal course work in essential related areas such as economics, areas of technical agriculture, public administration, sociology, etc. Regular university courses were reinforced by special seminars and tutorials. The Basic Study Program also includes intensive practical experience in the development of decision-making models. The last six months of this one-year program are largely devoted to a model development project in the participant's area of interest. This work is carried out in close interaction with experienced members of the study program staff.

The following courses formed the essential technical core for the Basic Study Program (course numbers are those at Michigan State University):

Basic Computer Science (CPS 120 and/or 300)	3-6 hours
Mathematics (Theory of Matrices--MTH 334)	4 hours
System Science	
Linear System Theory (SYS 810)	3 hours
Systems Methodology and Simulation (SYS 811)	3 hours
System Project (SYS 813 or equivalent thesis work)	12 hours
Advanced Systems Methodology and Simulation (SYS 801)	3 hours
Econometrics (AEC 835)	3 hours
Economic Development Planning (AEC 962)	3 hours
TOTAL HOURS	34-40 hours

A qualified participant could complete this core plus some "broadening" work and/or electives in a period of one year.

Participants were carefully selected on the basis of the following criteria:

1) Formal training (bachelor's degree) and experience in a relevant discipline--agricultural economics, egnineering, an area of technical agriculture, mathematics, statistics, etc.
2) A "flair for quantitative methods and solid preparation in basic mathematics and statistics which includes:[1]

[1]Candidates who are essentially qualified but weak in specific quantitative areas could remove deficiencies in a number of ways, including spending additional time at MSU.

a) college mathematics through differential and integral calculus (at least one year),

b) a course in probability theory, preferably based on the calculus, and

c) one or more courses in statistics, preferably including regression analysis.

3) Participants should be appropriately located in the institutional structure of a country that is seriously interested in the use of models as aids in policy, program, and project analysis.

4) There should be high probability that individual participants will be actively involved in analysis, research, teaching, or other work related to problems of agricultural sector analysis for a considerable period of time upon return to their home countries.

5) Adequate facility with the English language.

6) Adequate "infrastructure" in participating countries (computers, programmers, data acquisition, etc.).

During the second year of the program, a number of elements of the raining program were further developed. These included:

1) A two-term seminar to parallel basic courses participants take in System Science. (The seminar reinforced this basic material and provided more examples directly related to rural development.)

2) A graduate course with a section on simulation-based policy analysis

3) A course in advanced systems methodology and simulation. (This course was designed specifically for the needs of students developing large-scale simulation models such as those encountered in developmental planning.)

1973-74 Participants. The following participants have completed the 1973-74 Basic Development Analysis Study Program and have departed from Michigan State University:

Person	Status
Dong Min Kim	Chief, Sector Analysis Division, NAERI, Seoul, Korea
Ho Tak Kim	Department of Agricultural Economics, Seoul National University; Consultant, NAERI, Seoul, Korea
Jeung Han Lee	Department of Agricultural Economics, Chinju University; Consultant, NAERI, Seoul, Korea

Jong Tak Yoo	Ministry of Agriculture and Fisheries, Seoul, Korea
Y. K. Atta-Konadu	Ministry of Agriculture, Ghana
Seong Woo Lee	Lansing/Tri-County/Regional Manpower Administration (Michigan)

The following are still at MSU:

Bo Andersson	Agricultural Economics, Ph.D. Program, MSU
Seung Yuen Rhee	Economics, Ph.D. Program, MSU
Felix Nweke	Agricultural Economics, Ph.D. Program, MSU

1974-75 Participants. Participants in the 1974-75 program included:

Person	Status/Affiliation
Chang Bok An	Agricultural Economics (MSU) Staff Agricultural Economist at NAERI[1] (Korea)
Reza Ghanbari	Ph.D. Candidate in Agricultural Economics (Iran)
Arturo Gomez	Visiting Professor in Agricultural Economics (MSU), University of the Philippines (Philippines)
Kwanchai Gomez	Visiting Professor in Agricultural Economics (MSU), International Rice Research Institute (Philippines)
Sang Gee Kim	Agricultural Economics (MSU), Staff Agricultural Economist at NAERI[1] (Korea)
Sang Won Lee	Master's Candidate in Systems Science
Leanna Stiefel	Assistant Professor in Agricultural Economics (MSU)
David Watt	Ph.D. Candidate in Agricultural Economics (MSU)

The Korean participants are working on special projects related to the further development of KASS models. These include:

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[1]National Agricultural Economics Research Institute.

C. B. An	Poultry Subcomponent
S. G. Kim	Credit Constraints for Resource Allocation
S. W. Lee	Grain Price Analysis

Other Programs Planned

When the design of the development Analysis Study Program was drawn up several years ago, plans were made to give two other subprograms:

Orientation Study Program for decision makers and administrators, and Programmer's Study Program for computer programmers.

The purpose of the Orientation Study Program would be to provide decision makers, administrators and others with a basic understanding of the systems approach to planning and management and the use of quantitative models in decision making. The program is designed to be useful for decision makers and administrators who need or will need to converse with and understand staff analysts as quantitative techniques are applied to the management issues they face. The Orientation Study Program is also designed for others who need a broad understanding of this area. This program, of two-week duration, would include formal instruction in systems methodology and the capabilities and limitations of quantitative methods such as linear programming, simulation models, econometric models and critical path analysis. This training program would normally be held at Michigan State University though in special cases, sessions could be scheduled abroad. Laboratory sessions would be directed at exploring the use of an interactive approach to decision making involving quantitative models.

The Programmer's Study Program would be a variable duration program designed to produce computer programmers who can effectively program, maintain and operate decision-making models. The program would include formal training in computer programming and necessary related areas such as mathematics, statistics, and economics. The program would include intensive practical experience in programming and operating simulation, linear programming and other models as appropriate. Depending upon the background and preparation of participants, the program would involve 3-12 months in residence at Michigan State University.

It has not been possible yet to offer these two programs because of a lack of funds. Even with the Basic Study Program efforts have been made to have individual participants bring with them additional tuition funds to cover costs of intensive training beyond normal university course loads. These efforts have met with moderate success.

IV. DISSEMINATION AND UTILIZATION OF RESEARCH RESULTS

Project Output

Miscellaneous Reports and Working Papers

Abkin, Michael H. "On a National Macro Model Linking Korean Agriculture and Nonagriculture." KASS Working Paper 74-3. Seoul: Korean Agricultural Sector Simulation Project, 3 September 1974.

_____. "A National Economy Sector Model Linking Korean Agriculture and Nonagriculture." KASS Working Paper 74-7. Seoul: Korean Agricultural Sector Simulation Project, 31 December 1974.

Abkin, Michael H., and Wolf, Chris. "Accuracy in the Simulation of Distributed Delay Processes in Models of Socioeconomic Systems." Project Working Paper 74-2. East Lansing: Michigan State University, November 1974.

Baquet, Alan E. "Further Exploration of the User Cost Problem in Economic Theory." Project Working Paper 75-1. East Lansing: Michigan State University, June 1975.

Bauersachs, F. "Recursive Linear Programming Consulting Report." Seoul: Korean Agricultural Sector Simulation Project, July 1974.

Culver, David W.; Wright, Karl T.; and Rossmiller, George E. "The Korean Agricultural Statistics and Data Systems: Review and Recommendations." Report prepared by a Task Force of the Korean Agricultural Planning Project, Seoul, Korea, 20 August 1974. Seoul: Korean Agricultural Planning Project, 1974.

Grains Policy Task Force. "Analysis of Short Term Grain Policy Alternatives (For the Remainder of the 1974 Rice Year) in the Republic of Korea." Seoul: Grains Policy Task Force, 26 July 1974.

_____. "Analysis of Alternative Purchase Prices for Rice in the Republic of Korea." Seoul: Grains Policy Task Force, 16 September 1974.

Hanratty, Martin. "PERT Programming Methods for Project Appraisal--A Computer Program." Agricultural Economics Report Number 290. East Lansing: Department of Agricultural Economics, Michigan State University, May 1975.

"PERT Analysis--Korean Crop Breeding Project." KASS Issue Paper 11. East Lansing: Korean Agricultural Sector Simulation Project. June 1975.

Johnson, Glenn L. "Roles for Economics and Sector Planning (ESP) in OAA." Working Paper prepared for U. S. Agency for International Development, Washington, D. C., 8 September 1974.

_____. "Summary." Prepared for U. S. Agency for International Development, Washington, D. C., 9 September 1974.

_____. "A Proposed ESP Conference on Socio-Bio-Physical Systems Models." Working Paper prepared for U. S. Agency for International Development, Washington, D. C., 10 September 1974.

_____. "Food Grain and Energy Prices and Inflation." KASS Issue Paper 8. Seoul, Korea: Korean Agricultural Sector Simulation Project, 28 April 1975.

_____. Chapters for forthcoming book on Agricultural Change: Problems, Analysis, Policy being prepared by the TransAtlantic Committee on Agricultural Change:

Chapter IV: "A Critical Review of Selected Research on Agrarian Change"
Chapter V: "Philosophic Foundations--Problems, Knowledge and Solutions"
Chapter XII: "General Systems Simulation Analyses (GSSA) of the Nigerian and Korean Agricultural Sectors and Related Efforts"

Johnson, Glenn L., and Halter, Albert. "Technology of Information Systems." Working Paper submitted to the Office of Technology Assessment, Congress of the United States, Washington, D. C., 1975. Washington, D. C.: Office of Technology Assessment, Congress of the United States, 1975.

Kim, Dong Min. "An Interim Report on the Systems Simulation Model of A Korean Farm." East Lansing: Michigan State University, September 1974.

Kim, Ho Tak. "A Macro Model of Economic Growth and Income Distribution--An Application of Systems Simulation to the Korean Case." KASS Special Report 10. Seoul, Korea: Korean Agricultural Sector Simulation Project, 1975.

Korean Agricultural Sector Simulation Project Team. "Briefing Charts on the Korean Agricultural Sector Simulation Project." KASS Issue Paper 9. Seoul: Korean Agricultural Sector Simulation Project, 9 May 1975.

Rossmiller, George E.; Culver, David W.; and Wright, Karl T. "Revising Agricultural Production Statistics in Korea." East Lansing: Korean Agricultural Planning Project, 28 January 1975.

Rossmiller, George E.; Johnson, Glenn L.; and Hanratty, Martin E. "Global Modeling of Food and Agriculture: Background to a Possible Approach." Paper to be presented at the Third Global Modeling Symposium held at the International Institute for Applied Systems Analysis in Laxenburg, Austria on September 22-25, 1975 (in preparation).

Sloboda, John, and Carroll, Tom W. "Approaches to Modelling Off-Farm Migration." KASS Working Paper 74-5. Seoul, Korea: Korean Agricultural Sector Simulation Project, December 1974.

Teigen, Lloyd D. "A Sensitivity Test of the SEAPA Price Mechanism." Seoul, Korea: Korean Agricultural Sector Simulation Project, 29 July 1974.

_____. "An Intertemporal Price Equilibrium Model for Korean Rice." KASS Working Paper 74-4. Seoul, Korea: Korean Agricultural Sector Simulation Project, 2 December 1974.

_____. "Agricultural Trade and Food Self Sufficiency An Analysis of Korea for 1971-1985." KASS Working Paper 74-6. Seoul, Korea: Korean Agricultural Sector Simulation Project. (In Draft Form.)

Wolf, C., and Winer, C. "Syntax Description for the Policy Analyst's Language (PAL) Version 2.0." Project Working Paper 74-3. East Lansing: Michigan State University. (In Preparation.)

Journal Publications

Kim, Dong Min. "An Interim Report on the Systems Simulation Model of a Korean Farm." Korean Journal of Agricultural Economics, XVI, (December 1974), 71-95.

Papers Presented at Conferences, Seminars, Meetings

Johnson, Glenn L. "The Roles of the Economist in Studying Problems Involving Energy and Food," Presented at Annual Meeting of the Western Agricultural Economic Association held 24-26 July 1974 at Moscow, Idaho. Being published in proceedings issue.

Kim, Dong Hi. "Outline of Korean Agricultural Sector Study (September 1971 - June 1976), NAERI, Seoul." Paper prepared for Fourth FAO In-Service Training Seminar on Agricultural Sector Analysis, Bangkok: 9-20 June 1975.

Rossmiller, George E. "Developing an Analytical Capacity for Planning Agricultural Sector Development." Paper presented at the Economic Planning and Development Conference, Virginia State College, 31 July - 1 August 1975.

Ph.D. Dissertations

Buchner, Marcus Robert. "An Interactive Optimization Component for Solving Parameter Estimation and Policy Decision Problems in Large Dynamic Models." Unpublished Ph.D. dissertation, Michigan State University, 1975.

Lee, Jeung Han. "Projections of Product Supply and Factor Demand Under Structural Change for Korean Agriculture: A Systems Simulation Approach." Unpublished Ph.D. dissertation, Michigan State University, 1974.

Dissemination

Korean Counterpart Training

The field staff in Korea was not involved directly in any formal training activities during the report period. However, project staff did hold a number of seminars throughout the year for counterpart staff on various aspects of model development including the national economy component, the livestock component, the population component, and the grain management model. In addition, biweekly seminars and informal instruction were given to NAERI's computer programming staff.

Korean counterpart staff was involved in formal training programs abroad. After completing the one-year Development Analysis Study Program at MSU, D. M. Kim returned to become the chief of NAERI's Sector Analysis Division (counterpart staff to the KASS Project). S. G. Kim, C. B. An, and S. W. Lee departed early in the report period to attend the 74-75 Study Program at MSU.

S. J. Park, who recently received an M. S. degree from the Korea Advanced Institute of Science, will begin a Ph.D. program in systems science at MSU in September 1975. Upon completion of his degree he is expected to work with NAERI as a systems scientist.

Seminar at Korea Advanced Institute of Science

In March 1975, a two-hour seminar on the KASS approach and model was presented to approximately 50 students at the Korea Advanced Institute of Science, a graduate school founded in 1972 to provide graduate education and

degrees to highly qualified graduates of Korean universities. After the session several students asked if they could pursue student projects related to KASS work.

Meetings with ROKG Officials

In April 1975, in conjunction with the short-term visits of G. E. Rossmiller, G. L. Johnson, and R. Smuckler of MSU and L. Holdcroft and L. Fletcher of USAID/Washington, a series of meetings were held involving KASS/KAPP staff and USAID/Korea officials with bureau chiefs in MAF and the ministers of the Agriculture and Fisheries, Economic Planning Board, and Science and Technology. The purpose was to discuss agricultural policy analysis needs of ROKG and the KASS/KAPP potential for meeting those needs. The meetings were important because NAERI (and KASS) received encouragement and support at the interministerial level. In particular, NAERI was given support to upgrade its status.

FAO In-Service Training Seminar

M. H. Abkin presented two 90-minute sessions at the FAO Fourth In-Service Training Seminar on Agricultural Sector Analysis which was held in Bangkok, 9-20 June 1975. The first 90-minute session covered general methodology and the sector and grain management models. Participants expressed particular interest in the endogenous demand models, the input-output linkages with nonagriculture, the population and nutrition components and the grain management models. Also participants found the general discussion of the systems approach and how the agricultural sector is viewed as a system to be very helpful. The second 90-minute session on the utilization and institutionalization went well in spite of the fact that Dr. Kim, Dong-Hi, Director of NAERI, was unable to make the trip in order to lead this session.

Michigan Model Demonstration

Since its development in the spring of 1974, the Michigan Agricultural Sector Simulation Model (MASS) linked with the Policy Analysis Language (PAL) has been demonstrated at MSU to personnel associated with the following institutions:

May 1974	Michigan Department of Agriculture
May 1974	Policy Advisory Board for the Computer Library for Agricultural Sector Simulation
November 1974	MSU Department of Agricultural Economics
March 1975	U. S. Department of Agriculture, ERS and NEAD (demonstration held in Washington, D. C. by remote access to the MSU computer)
Spring 1975	Korean Ministry of Agriculture and Fisheries
Summer 1975	Midwest University Consortium for International Activities: Conference on organization and schedule of resource people for design workshop on institutional development, 5-16 August 1975.

IIASA Collaboration

During the period 9-13 June 1975 Glenn Johnson and George E. Rossmiller traveled to the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria to discuss possible areas of collaboration with that institution. Results of that meeting were: (1) a joint proposal is being prepared between MSU and IIASA for submission to the U. N. Environmental Program (UNEP) for continued work on the software library (CLASS) and the Policy Analysis Language (PAL); (2) a proposal will be submitted to IIASA for development of a monograph on the State of the Art in national level modeling of agricultural sector; probably with Al Halter, Mike Abkin, and Hartwig deHaen as participants; and (3) G. E. Rossmiller has been invited to present a paper on global modeling in food and agriculture at the Third Global Modelling Symposium conducted at IIASA during 22-25 September. This may lead to additional collaborative work on such modeling.

Project AGRIMOD

Dr. Glenn Johnson served on the Advisory Board to Project AGRIMOD, an NSF-sponsored project undertaken by Systems Control, Inc., of Palo Alto, California. The purpose of the project is to develop a national-level model of the U. S. agricultural sector. Through consultation with Dr. Johnson and other project staff, Project AGRIMOD staff have taken several components from the software library for use in their own modeling work. Also, relatively rough components related to the work on investment/disinvestment theory reported earlier were developed in cooperation with SCI. These have worked reasonably well.

National Agricultural Economy Model

The MSU Department of Agricultural Economics is also involved in another project[1] which is developing a model of the U. S. national agricultural economy with an emphasis on production, consumption, and international trade. While a substantial portion of the model is "econometric" in nature, our project has contributed components and the training of staff.

Visitors to MSU Campus Relative to the Project

25 September - 2 October 1974--Mr. Steve Haas, Systems Control, Inc., member of Project AGRIMOD Team modeling U. S. agricultural sector under an NSF grant met with Dr. Johnson and other staff members.

31 October - 1 November 1974--Dr. Pyong-Choon Hahm (Ambassador of Korea) and Mr. Joong Il Suh, (Korean Agricultural Attache) visited MSU for discussions with Koreans in the area and MSU Simulation Project personnel for Korean Projects Briefing.

4 November 1974--Jung, Kyu-Won; Kim, Dong-Jun; and Oh, Wan-Su from MAF, Seoul, Korea visited with Dr. Rossmiller, Dr. Johnson, Dr. Wright, and Mr. Pervis. They were visiting various institutes and universities in the U. S. as an intermediate level observation team.

5 November 1974--David Mateyka, USDA, visited with Dr. Rossmiller to familiarize himself with programs at MSU.

6-7 December 1974--Dr. Everett Hagen, MIT, formerly from MSU's Economics Department was at MSU for Fall Term Commencement to receive an honorary Doctor of Law Degree. While here he met with members of our project.

19-20 December 1974--Mr. Lane Holdcroft and Mr. John Foti, Asia Bureau, USAID, visited our project to familiarize themselves with our work since our Korean Simulation Project now falls within the purview of their office.

29-30 December 1974--Mr. John Sloboda met with members of the Agricultural Sector Simulation Project to discuss the recent report on rural-urban migration written in Korea by Mr. Sloboda and Dr. Tom Carroll.

20-21 February 1975--Dr. Alexander Levis, Systems Control, Inc., California, member of Project AGRIMOD Team.

20 February 1975--Dr. Leroy Quance, USDA/ERS met with project members. While on campus he presented a seminar entitled Economic Projections and Analytical Systems.

25 March 1975--Dr. Morteza A. Rahimi met with project members on a short return visit to MSU from his leave of absence in Iran.

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[1]Supported by the Agricultural Experiment Station and the John Deer Manufacturing Company.

Miscellaneous Meetings and Seminars

2-4 September 1974--Dr. George E. Rossmiller went to Washington, D. C. to attend the National Academy of Sciences planning session for a workshop to be held in Fortaleza, Brazil. (No travel cost to Project.)

12-22 September 1974--Dr. George E. Rossmiller traveled to Fortaleza, Brazil to participate in a National Academy of Sciences Workshop on Science and Technology in the Use of Semi-Arid Land in Northeast Brazil. (No travel cost to Project.)

16-18 September 1974--Dr. Glenn L. Johnson traveled to Oxford, England to consult with Dr. Oseni, Director, Nigerian Department of Forestry, and Felix Nweke on the forestry model for his Nigeria research under AID/csd-2975.

3-4 October 1974, 9, 23 January 1975--Dr. Johnson attended conferences on Project AGRIMOD in Washington, D. C. as a member of the Advisory Board.

8 October 1974--Dr. George E. Rossmiller went to Washington, D. C. to meet with the Africa Bureau, AID, to present a seminar for the DAP Group on "Planning in the Sahel." (No travel cost to Project.)

5 December 1974--Dr. George E. Rossmiller and Dr. Kelly Harrison presented an Agricultural Economics Seminar on "Marketing Systems and Sector Analysis as Alternative Approaches to Rural Development."

10 December 1974--Dr. Tom W. Carroll consulted with Dr. Dale Adams, Ohio State University, on processing Korean farm household surveys onto magnetic tape for use in his rural savings analysis project and possible subsequent use for sector analysis.

28 January 1975--Dr. George E. Rossmiller presented a seminar for the Family Ecology Department at MSU.

17 February 1975--Dr. George E. Rossmiller presented a seminar for Soil and Man's Environment at MSU.

13 June 1975--Dr. Johnson attended a meeting of the Agricultural Development Council in Madison, Wisconsin.

17 July 1975--Dr. George E. Rossmiller presented a seminar on the "Agricultural Sector Analysis: KASS" for the Geography Department at MSU.

Utilization

Utilization of KASM 2 in Fourth Five Year Plan

On 13 June 1975 a meeting between KASS/KAPP/NAERI staff and H. K. Lee of the Economic Planning Board (ROKG) and Mr. Kim (Planning Director) of

the Ministry of Agriculture and Fisheries was held for the purpose of presenting preliminary KASM base projections plus two ADC land and water development alternatives. This was an important first-step in developing working level contact with planners on the Fourth Five-Year Plan. Although the results presented were very preliminary, ROKG officials seemed pleased with the direction of the work.

Grains Policy Task Force

As reported earlier the KASS/KAPP personnel used components of the grain management model to run analyses for the Grains Policy Task Force, which was set up by the Korean Ministry of Agriculture and Fisheries to make recommendations regarding: (a) alternative short-term grain policies for the last quarter of the 1974 rice year, (b) alternative purchase prices for rice in the 1975 rice year, and (c) barley purchase price policy (to be coordinated with wheat and rice price policy) for the 1975 rice year.

Software Library

Components of the software library including the Policy Analysis Language have been requested from outside the project by:

Project AGRIMOD, Systems Development, Inc., Palo Alto, California

National Agricultural Model Project, MSU, Department of Agricultural Economics

Laverne Faidley, Tanzania

Jackie Grossman, MSU Human Ecology class project, spring term, 1975, program to calculate energy usage in the home

Feedback

With respect to feedback requests for information and materials from other LDCs and agencies, the Agricultural Sector Analysis and Simulation Projects has had requests for information and materials from personnel in Malaysia, Iran, Iraq, U. S. Department of Agriculture, International Institute for Applied Systems Analysis in Laxenburg, Austria, the AID Mission in Egypt, the AID Mission in Colombia, the University of Ceara in Fortaleza, Brazil, and Donella Meadows' group at Dartmouth.

LDC Involvement

All field work undertaken by this project has involved the field project staff working closely with counterparts. Planning, field work, and analysis in Korea is coordinated with the Sector Analysis Division of the National Agricultural Economics Research Institute. The staff work for the Grains Policy Task Force was undertaken jointly by project staff and Korean personnel.

Field Trips

Also, the following extended field trips were taken by field project personnel and Korean counterpart staff during the report period:

Dates: 14-19 October 1974

Personnel: Abkin, Carroll, Duvick, Mangum, D. H. Kim, D. M. Kim, Oh, Min, Hwang

Itinerary: Taegu, Yeongcheon, Gimhae, Chinju, Suncheon, Kwangju, Iri, Yesan, Pyeongtaek

Purpose: To visit with local government officials, research station personnel, cooperative leaders, farm machinery manufacturers, and farmers to determine the general state of agricultural development, with particular focus on mushrooms, rice and barley, vegetable and fruits, sericulture, farm machinery, land improvement, and beef and dairy.

Dates: 11-14 March 1975

Personnel: Thodey, Mangum, N. S. Lee

Itinerary: Kwangju, Yeosu, Pusan, Taegu

Purpose: To acquire background knowledge of Korean agricultural production and marketing, particularly NACF facilities and operations.

Dates: 22-28 June 1975

Personnel: Gibson, Thodey, D. M. Kim, H. D, Hwang

Itinerary: Milyang, Taegu, Pusan, Kwangju

Purpose:

(1) To observe and interview at the period of peak labor utilization (the period of harvesting barley and planting rice in the double cropping area) in order to validate the handling of this critical period in both the KASS and GMP models.

(2) To observe and interview metchants and handlers of grains, including past facilities, mills, warehouses, wholesalers, NACF, farmers, in order to validate the structure and some of the parameters used in both the KASS and GMP models.

WORK PLAN

The following is the work plan for the final year of the project.

Field Operations in Korea

Korean Agricultural Sector Model (KASM)

Table 2 presents an outline of the capabilities, utilization and timing of the various versions of the sector model. During the remaining one year of the contract (currently the termination date is scheduled for 30 June 1976), the field project staff plans to devote its efforts in two main areas with regard to KASM:

1) Utilization of KASM 2 for the development of the Fourth Five-Year Plan and other operational problem-solving analyses in interaction with MAF and EPB decision makers, and KAPP personnel.
2) Development and "installation" of KASM 3.

Figure 5 presents a schematic of the important components and linkages to be included in KASM 3. The important new components in Version 3 include:

National Economy Component (NECON)
Yield and Input Demand Component
Population-Migration

Much of the work on the national economy, yield and input demand, and population-migration components has already been done as described earlier in the report. The main effort will be directed toward linking these components to the current version and testing, tuning, and validating the operation of KASM 3. A fisheries production will be added only if there is sufficient time and resources.

References to KASM 4 ... n in Table 2 indicate the direction of future development work which can be carried out by NAERI after the termination of the contract.

Table 2

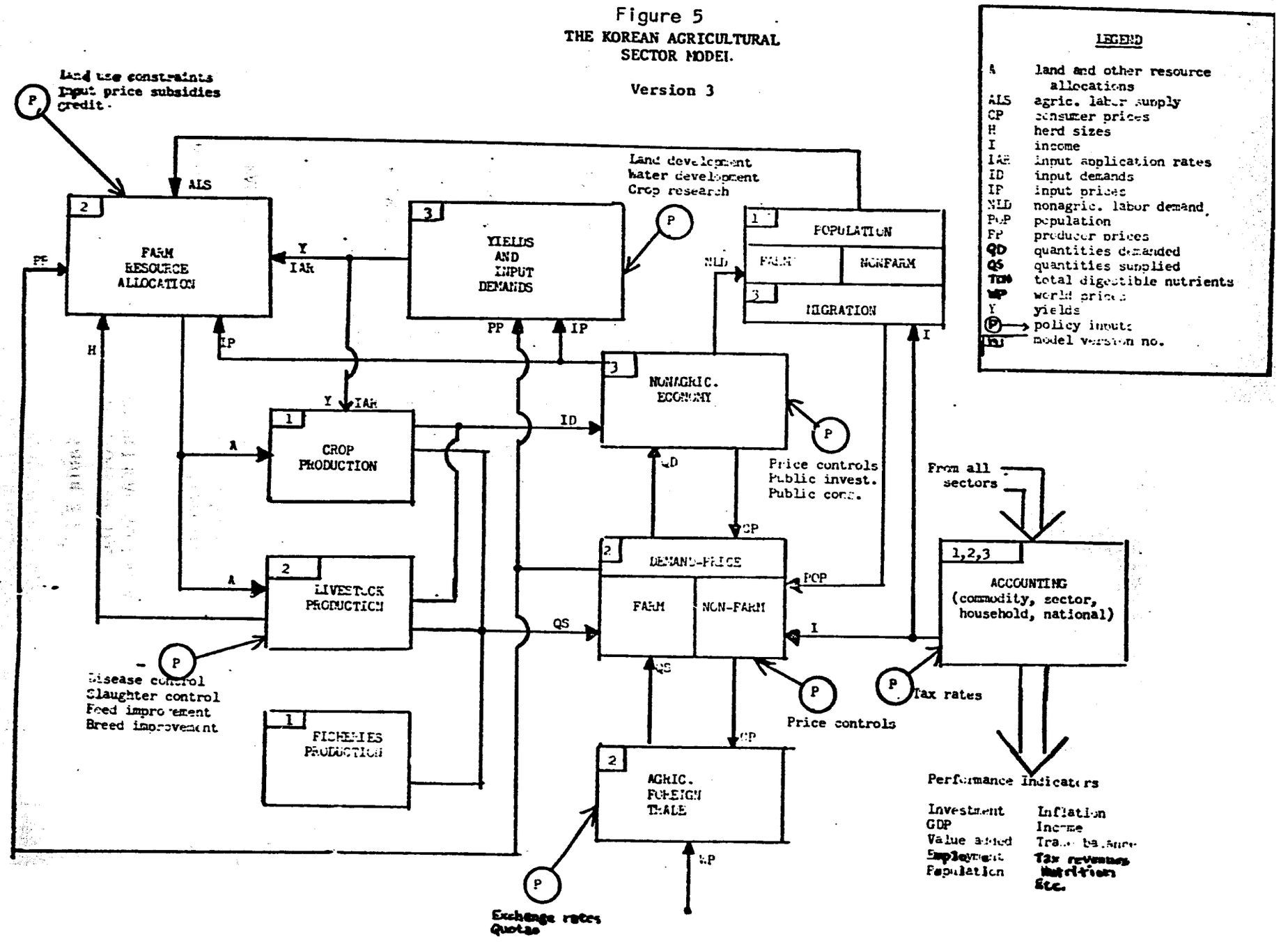
VERSIONS OF THE
KOREAN AGRICULTURAL SECTOR MODEL

Date	Version No.	New or Improved Components/Models	Utilization
1973	KASM 1	Annual Crop Production Perennial Crop Production Seasonal Crop Production Farm Consumption Urban Demand Population	KASS Report (1972) Investment Study Report (1972) MAF 1973-81 Projections (1973)
1975	KASM 2	Resource Allocation Livestock & Feed Market Price International Trade	4FYP Medium-Range Projections (5-15 years) Price Policy Analysis
1975	KASM 3	National Economy MAF Accounting Migration Yield & Farm Input	Investment Policy Analysis National Economy Policy Analysis
1976	KASM 4	Livestock Cohort Component Fishery Forestry Linkage with data system for flexible disaggregation by region, commodity, sector Processing Marketing	Regional Analysis Weather Impact Analysis MAF Fiscal Policies Annual Production Plan Market Policy Analysis
•	•		
•	•		
	n		

Figure 5

THE KOREAN AGRICULTURAL SECTOR MODEL

Version 3



Grain Management Program Model (GMP)

Work on developing an internalized price generation mechanism will be completed. Work will continue on testing, validating, and documenting Version 1 of the grain management model. Korean counterparts will be trained in the use of the model for policy analysis. It is expected that the full model[1] will be used for preliminary grains policy analysis by the end of the project.

Campus Activities and Research

User's documentation on the "interactive optimization component for solving parameter estimation and policy decision problems in large dynamic models" will be completed during the next year by Marc Buchner.

Graduate thesis research to be supported by the project during the coming year include: (1) Bo Andersson's research on government influence of local agricultural producers and consumer behavior, (2) Mike Jaske's effort to develop a livestock management model, and (3) Myung Rhee's research on the role of money, monetary policy, and inflation in economic development.

Software Library

A major effort will be spent on further testing and documenting the Policy Analysis Language (PAL). A detailed reference manual has been completed and is ready for printing. Other important documentation remains to be written: (1) an abstract outlining PAL's capabilities, (2) a programmer's manual explaining how to link PAL to an existing model and how to write a dialogue between the policy analyst and the model, and (3) a user's guide to running a simulation model through PAL from a terminal.

It is planned to link PAL to Version 2 of the Korean Agricultural Sector Model in order to test PAL and facilitate training study program participants from Korea in the use of the model.

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[1] Components of the model have already been used by the Grains Policy Task Force for policy analysis as reported earlier.

Project staff will also consult with USDA/ERS in using PAL with several USDA models.

An effort will be made to identify, "CLASSify," and document substantive components from the Nigerian model, the Korean model, and other models for inclusion in the library.

Development Analysis Study Program

The Development Analysis Study Program will not be funded by this contract during the coming year.

The study program will be continued on an informal basis through special seminars and projects for students who are interested in the "systems" perspective on development. Three students, thus far, have indicated interest in the program. It is hoped that outside institutions supporting these students will agree to provide extra tuition funds to support special training received under this program.

Proposed Budget

A firm budget for the period 1 January 1975 to 30 June 1976 which will support this research effort to the termination of the contract will be found in Appendix D.

VI. PERSONNEL

Research Staff

Dr. George E. Rossmiller, Associate Professor and Project Director, consulted with AID officials throughout the period on project management and administered all project activities from the East Lansing headquarters. From 19 May - 27 August 1974 Dr. Rossmiller went to Korea to devote four months of his time to the KAPP and KASS Projects, working on the work plan, annual report and providing the leadership to place the KASS team in a position to help write the ROKG Fourth Five-Year Plan. In connection with KAPP he administered the beginning of the KAPP project and served on two task forces--agricultural statistics and grain policy. He returned to Korea for the period 31 March - 28 April 1975 to finalize plans for KASS field work in Korea during the final year of the project and to assist coordinating KASS/KAPP contributions to Fourth Five-Year Plan and grains policy analysis.

Other travel concerned with project administration included the following:

11-12 November 1974--Washington, D. C. to discuss on-going research programs in simulation and the scope of work which is currently being revised.

15 November 1974--Chicago, Illinois to participate in a MUCIA/Korea Task Force Meeting. (No travel cost to Project.)

3-4 December 1974--Washington, D. C. to discuss the future scope of work on Contract AID/csd-2975.

13-15 January 1975--Washington, D. C. to consult with USAID on contract extension.

17-19 March 1975--Washington, D. C. to visit with Lane Holdcroft at the USAID, East Asia Bureau.

11-18 June 1975--Austria and Germany to consult with Dr. deHaen in Germany and researchers at the International Institute of Applied Systems Analysis, Laxenburg, Austria.

Dr. Glenn L. Johnson, Professor and Senior Agricultural Economist, worked with graduate students connected with the project, developed papers pertaining to project subject matter, and consulted with other project staff. On 16-17 July, 30 July, and 14 August 1974 Dr. Johnson went to Washington, D. C. to consult with AID officials concerning AID/csd-2975 research. He also served as consultant to the field project staff

in Korea from 19 March to 30 April 1975, consulting on plans for phasing out the MSU team from Korea. He also wrote a KASS Issue Paper on the impact of Korean grain price policy on inflation.

Dr. Thomas J. Manetsch, Professor and Senior Systems Scientist, continued to administer the training program and consult with training program participants and graduate students connected with the project. From 14 June - 1 July 1974 and 25 June - 28 July 1975 Dr. Manetsch traveled to Seoul, Korea to consult with MSU research team personnel on the development of the grain management program model and its utilization for policy analysis.

Dr. Tom W. Carroll, Associate Professor, continued as Field Project Leader in Korea until 30 April 1975 with primary responsibilities for: (1) liaison between the KASS Project and the Mission, MSU, Korean Government, and other agencies, primarily the National Agricultural Economics Research Institute (NAERI); and (2) direction of activities related to further development of the KASS models in Koren. He also worked on operationalizing the national version of the sector model (KASM 2) at KIST, coauthored a working paper on migration (WP74-5), and continued work on revising the population component. He returned to the MSU campus in July 1975 to assist with campus activities and research for the remainder of the project.

Dr. Alan Thodey, Associate Professor, joined the field staff in Korea in February 1975 as the Agricultural Economist after spending four years as agricultural economist with the Ford Foundation's Multiple Cropping Project in Chiang Mai, Thailand. During the remainder of the period Dr. Thodey reestimated price and income elasticities for 19 commodities and began updating yield projections and other parameters required by the sector model. He also participated in the barley price policy analysis work.

Dr. Michael H. Abkin, Assistant Professor, transferred from project headquarters in East Lansing to the field operation in Korea and arrived in Seoul on 16 July 1974. Dr. Abkin's major responsibilities with the project during this period were the design, programming, and data analysis for the national economy component and the debugging and tuning of the national version of the sector model (KASM 2) at KIST in preparation for the use of KASM 2 for the Fourth Five-Year Plan analysis. He authored

two working papers (74-3 and 74-7) on the national economy component. He participated in the staff work for the barley price policy analysis carried out by the Grain Policy Task Force in the spring of 1975. From 16-20 June 1975 he attended the Fourth FAO In-Service Training Seminar on Agricultural Sector Analysis in Bangkok and gave a presentation on KASS work. On 1 May 1975 he assumed the duties of Field Project Leader.

Dr. Lloyd D. Teigen, Specialist in Agricultural Economics, departed Korea on 6 December 1974 after serving 23 months in Korea with the KASS Project. During the final five months he operationalized the market-price component and completed a first draft of a working paper (74-6) describing preliminary policy runs with the three-region linked KASM 2 model operating at the National Computer Center. He also completed work on a "mini-model" for analyzing storage behavior for a single commodity (WP 74-4) and consulted with the Grains Policy Task Force. From 15-18 January 1975 Dr. Teigen met with project members in debriefing sessions upon his return from a long-term overseas assignment with the project.

Mr. Forrest J. Gibson, Specialist in Systems Science, continued work on the grain management program model (GMP) and consulted for the Grains Policy Task Force on the use of rice/barley/wheat demand model for analysis of price policies. While on home leave during August 1974, he consulted with MSU project staff and his graduate committee.

Ms. Claudia S. Winer, Specialist in Computer Programming, continued work with the training program and the software library, particularly the design, programming, and demonstrations of the Policy Analysis Language. From 1 September - 31 December 1974, Ms. Winer traveled to Seoul, Korea to assist in the training of Korean counterparts in relation to the Simulation Project and to aid MSU project personnel in the development of the grain management model at a critical stage in its development. She also developed data base software for processing agricultural time series data.

Mr. Gary R. Ingvaldson, Specialist in Computer Programming, served as field project computer programmer in Korea spending most of his time operationalizing and testing the national version of KASM 2 but also helping with the GMP. He also conducted informal training sessions for the Korean counterpart programming staff.

Mr. Dennis W. Pervis, Specialist, developed a generalized regional accounting component for inclusion in the library.

Mr. Chris Wolf, Programmer, worked on the development of the Policy Analysis Language and documentation and programming of software library components. He also consulted with training program students on programming the computer for their projects.

Mr. Frank Huybrechts and Mr. Carl Wright, Programmers, worked on programming the Policy Analysis Language and writing preliminary program documentation.

Research Consultants

Dr. Friedrich Bauersachs, Institute for Agricultural Policy, Marketing and Rural Sociology, Bonn, Germany on 22 July 1974, completed a two-month assignment during which he provided considerable help in the efforts to operationalize the RLP resource allocation component both in the three-region version of the sector model at the National Computer Center and in the national version at KIST. During this same period Ms. Herta Bauersachs worked as a programmer on the RLP component.

Dr. Hartwig deHaen continued work in Germany on the recursive linear programming resource allocation component to incorporate: (a) capital and credit activities, and (b) construct and generally improve the model to better reflect farmer behavior and the economic realities in Korea.

Dr. Karl Wright, Agricultural Economist, worked with the Director on preparation of reports, assisting with project visitors, and consultation with other project staff.

Mr. John Sloboda, Harvard Ph.D. candidate in East Asian studies and regional analysis, consulted with the project as co-author of a working paper on "approaches to modeling off-farm migration." In May 1975 he received a USAID grant to continue empirical research on off-farm migration.

Mr. Keith Olson, Programmer, worked for several months generalizing the KASS price determination component for inclusion in the software library.

Graduate Assistants

The following graduate assistants carried out project research indicated below (and described earlier):

Person	Research
Andersson, Bo	Government Community Development Programs
Baquet, Alan	Investment/Disinvestment Theory
Buchner, Marcus	Optimal Search Techniques
Hanratty, Martin	PERT Analysis
Jaske, Michael	Livestock Management Model
Rhee, Myung	Monetary Theory
Nweke, Felix	Forestry Sector Model

The memorandum of agreement with Professor Samson Olayide and the University of Ibadan remains in force. This memorandum of agreement supports Mr. Cyril Aja in a master's degree program of research in the development of a production model of the kolanut industry in Nigeria.

Administrative Staff

Mr. Bert M. Pulaski serves on campus as the Administrative Officer on a part-time basis coordinating the financial, personnel, and logistic aspects of the Project.

Miss Judy Pardee is the Project Secretary on campus; her responsibilities include normal secretarial duties along with maintaining the simulation library and coordinating conferences.

Mrs. Barbara Haltom and Miss Kyong Soo Kim served as Project Secretaries in Seoul, Korea.

Korean Agricultural Planning Project Staff

The field project staff in Korea coordinated very closely with the field staff of the Korean Agricultural Planning Project. Because of this close coordination, KAPP staff are listed below although they were not supported under Contract AID/csd-2975.

Dr. Fred A. Mangum, Field Project Leader of KAPP, Associate Professor of Economics and Extension Economist on leave from North Carolina State University, also was designated as KASS/KAPP Field Project Coordinator. As such his responsibilities include: (1) insuring that the complementarities between KASS and KAPP are fully exploited through (a) the use of the KASS models and analytical capability to backstop work being done by KAPP personnel, (b) mobilization of the KASS personnel and resources directed toward operational analysis of problems and issues identified by KAPP, and (c) keeping KASS development personnel informed of the relevant issues to insure that model development directions are compatible with decision maker needs; and (2) insuring overall coordination of personnel, resources, logistics, support from the Mission, and other matters where commonality exists among both projects. The intent of this administrative structure is to insure that intensive direction is provided to model development on the one hand and operations and applications on the other within KASS, and that KASS develop into a relevant and useful analytical backstopping entity for decision makers concerned with the development of the agricultural sector, a main avenue for this development to be through KAPP. In addition to his duties as KASS/KAPP Field Project Coordinator, Dr. Mangum served as the KAPP Policy Analyst in the Planning Coordinator's Office of the Ministry of Agriculture and Fisheries.

Dr. Richard Duvick, Associate Professor of Agricultural Economics and Rural Sociology on leave from The Ohio State University, served as Program and Project Analyst with the Agricultural Development Corporation in Anyang, Korea, particularly with respect to land and water development project analysis using an LP model and the KASS sector model.

Dr. Stanley Driskell, formerly Senior Economist, TransCentury Corporation, Washington, D. C., arrived in Korea in May 1975 to begin work as Statistical Consultant to Economic Statistics Division of MAF.

Mr. David Culver, on leave as Leader, Commodity Program and Policy Analysis, Economic Research Service, USDA, was due to arrive in Korea in July 1975 to serve as Outlook Analyst. He had spent one month in Korea on short-term assignment during the previous year.

Korean Counterpart Staff

Dr. Dong Hi Kim, Director of NAERI, continued to give full support and encouragement to the KASS work. He provided valuable suggestions and criticism of the direction of KASS work and acted as an advocate of KASS sector analysis efforts within MAF.

Dr. Jeung Han Lee, completed graduate work for the Ph.D. in Agricultural Economics during the report period. His thesis research was the development of a yield determinational component for the KASS model, and in December 1974, he returned to Korea to work part-time under contractual arrangement with NAERI to link this component with the rest of the KASS model. While at MSU he was supported with ADC funding.

Mr. Dong Min Kim returned to Korea in September 1974 after successfully completing the one-year Development Analysis Study Program in system science and agricultural economics at Michigan State University. He took over as chief of the recently created Sector Analysis Division in NAERI from Dr. Soon Pyo Chyun who had been acting chief for the past eight months.

Mr. Sang Gee Kim and Mr. Chang Bok An departed from Korea in September 1974 to attend the Development Analysis Study Program at MSU. Mr. Sang Won Lee had departed in May 1974 to attend the Summer Economics Institute at Colorado State University for foreign students and then the Development Analysis Study Program at MSU. All three men are on leave from the Sector Analysis Division at NAERI and will greatly strengthen the division on their return.

Mr. Hong Do Hwang returned from overseas study in Australia after receiving an M. S. in agricultural development economics from Australia National University in Canberra. He has provided very valuable assistance for economic data analysis required for the national economy component.

Mr. Sun Jeung Lee devoted most of his time to collecting, plotting, and analyzing monthly time series data on production, imports, and consumption of rice, barley, and wheat in support of the efforts to validate the Grain Management Model.

Mr. Kong Nam Hyun assisted in the collection and analysis of time series data for the sector model and has started in the FORTRAN course at KIST before transferring to the Marketing Section of NAERI in December 1974.

Mr. Bu Kwan Lee served as head programmer in the NAERI Programming Section assisting Dr. Teigen in operationalizing the three-region KASM 2 model at the National Computer Center and later take over as the programmer on the GMP after Ms. Winer's departure from Korea in December 1974.

Mr. Chul Ho Kim completed an analysis of fertilizer demand and carried on independent study of English, math, statistics in preparation for leaving in May 1975 to attend the University of Kentucky on a Master's program in outlook analysis.

Mr. Hyo Bok Lee made good progress as a programmer during this period. He handled the runs of the mini-model for grains policy analysis, time series processor runs for econometric estimation of model parameters, and the programming of the revised outputs for KASM 2 at KIST.

Mr. Young Suk Kim finished editing the MAF Livestock Model and is working on documentation of the model in Korean. He also completed the FORTRAN course at KIST.

Miss Kyong Suk Park continues to give very able assistance in collection and analysis of various data in support of the KASS modeling effort.

Miss Keum Sook Song was hired as keypunch operator/clerk for the NAERI Programmer Section and began the basic course in computers at KIST.

Other clerical and administrative assistants in the NAERI Sector Analysis Division included Miss Yong Sa We, Mr. Joo Eul Kim, and Mr. Young Sub Kim.

Two consultants to NAERI--Dr. Bai Young Sung and Dr. Ho Sung Oh, consulted at times with the KASS Project staff.

Mr. Byung Ryul Min, although assigned to the Agricultural Production Division after his return from Louisiana State University in October 1974 with an M. S. in agricultural economics (major emphasis on livestock), consulted with KASS on modeling and data requirements of the livestock subsector.

Involvement of Minority Personnel and Women

In keeping with University Policy, the Project has employed women and personnel from various ethnic groups in both secretarial and professional positions. The project has also employed cooperating country personnel as well as other personnel from various countries other than the U. S. and Korea.

APPENDICES

APPENDIX A

SI SSIE 76

FORM APPROVED
OMB NO. 100 R0002
EXPIRES 11/76

SIE NO.

SMITHSONIAN
SCIENCE INFORMATION EXCHANGE, INC.
1730 M STREET, N.W. PHONE 202-381-5511
WASHINGTON, D.C. 20036

NOTICE OF RESEARCH PROJECT

SUPPORTING AGENCY:
U. S. Agency for International Development

AGENCY'S NUMBER(S):
Contract No: AID/csd-2975
and/or
Control No:

TITLE OF PROJECT:
Adapting and Testing of Agricultural Simulation Models to Sector Analysis

PRINCIPAL INVESTIGATOR, ASSOCIATES	School or Division	Department
Dr. George E. Rossmiller	Michigan State University	Agricultural Economics
Dr. Glenn L. Johnson	Michigan State University	Agricultural Economics
Dr. Thomas J. Manetsch	Michigan State University	Systems Science
Dr. Tom W. Carroll	Michigan State University	Social Science Research
Dr. Michael H. Abkin	Michigan State University	Systems Science

RECIPIENT INSTITUTION:
Name and Address: Michigan State University
206 International Center
East Lansing, Michigan 48824
Including Zip Code.

PERIOD FOR THIS NRP:
Start Date: 1 July 1974
End Date: 30 June 1975
Annual Funding: $391,880

SUMMARY OF PROJECT: **Be brief-200 word maximum: (Include Objective, Approach, Current Plans and/or Progress**

Annual Report for Period 1 July 1974 to 30 June 1975

Version 2 of the Korean Agricultural Sector Model was made operational in Seoul, Korea. It includes a recursive LP resource allocation component, a livestock and crop production component, a demand-price component (farm/nonfarm), agricultural trade component, an accounting component, and a population component. The model was used to make preliminary projections for the Fourth Five-Year Plan. Work is proceeding on incorporating a national economy component, a yield/input-demand, and an off-farm migration mechanism into Version 3 of the sector model.

Version 1 of the Grain Management Program Model was completed except for an internal price generation mechanism. Components of the model were used during the year to make recommendations to the Korean Ministry of Agriculture in grains price policy for rice, barley and wheat.

Research work was completed on: (1) developing an interactive optimization component for solving parameter estimation and policy decision problems in large dynamic models, and (2) further theoretical analysis of investment/disinvestment in durable capital for agricultural production, and (3) application of the Program Evaluation and Review Technique (PERT) to an analysis of the work plan for the USAID/ROKG Korean Crop Improvement Project.

A Policy Analysis Language was developed to provide means for a policy-planner unfamiliar with computer technology to test alternative policies with a simulation model run from a terminal. It also facilitates sensitivity analysis of model parameters by model developers.

Work continued on generalizing and documenting components for the Computer Library for Agricultural Systems Simulation (CLASS).

Eight trainees participated in the Development Analysis Study Program which focused on the application of the general system simulation approach to project, program, and policy formulation and implementation particularly with respect to agricultural development.

Project staff consulted with: (1) Systems Control, Inc., Palo Alto, on the NSF-sponsored project AGRIMOD which is developing a U. S. agricultural sector model, (2) USDA/ERS on the use of the Policy Analysis Language with their models, and (3) The International Institute of Applied Systems Analysis in Austria on possible collaboration in the area of global and national modeling of the food/population balance.

APPENDIX B
KOREAN AGRICULTURAL PLANNING PROJECT

The general objective of the Korean Agricultural Planning Project[1] is to increase the capacity of the Ministry of Agriculture and Fisheries and through them the government of the Republic of Korea for sound planning, agricultural policy formulation, program development, and project design and execution toward more rapid and effective development of the agricultural sector. General project working objectives include: (1) to understand the organizational structure and the operational processes presently used by MAF in planning and developmental activities and to identify the constraints in these systems leading to ineffective, inefficient and operationally unsound outcomes; (2) to advise on organizational and functional means to eradicate the constraints identified in (1) above; and (3) to do substantive work on current issues, within the scope of the project, to relieve current problems and to provide on-the-job training in the use of modern analytical techniques and processes for Korean personnel of the Ministry of Agriculture and Fisheries.

This technical assistance as conceived at project inception included the following long-term personnel: (1) policy analyst (agricultural economist) working with the Planning Coordinator's office, MAF; (2) an agriculture outlook analyst (agricultural economist) working with the appropriate agency in MAF, probably the Statistics Bureau; and (3) a program and project evaluation analyst (agricultural economist) working initially with the Agricultural Development Corporation (ADC), (MAF operational agency responsible for land and water development), but also available to work with other MAF agencies as appropriate. The planning horizon for this project is June 1974 to June 1977 with a review at the end of each year to assess progress and to determine specific project emphases and work plan for the following year. In addition to the above designated personnel, provision is made in the project for bringing in short-term project personnel and consultants as determined appropriate

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[1] Set up under a contract between the Republic of Korea Government (ROKG) and Michigan State University and supported by a program agreement between USAID and ROKG dated 6 December 1973.

as the project unfolds and in interaction between the long-term KAPP personnel and ROK Government personnel with whom they are working. The contract was amended to include a statistical consultant to work with the Statistics Bureau in MAF in the area of statistical data processing.

The KAPP and KASS personnel must coordinate and work closely together in order to exploit the complementarities of the two projects. To assure this coordination between projects a single field project coordinator has been designated to handle the administrative and personnel details with the back-stopping office at Michigan State University, and the internal policy liaison and coordination functions between the two projects.

In order to accomplish their individual and combined KAPP Project objectives, KAPP personnel must closely coordinate and integrate their activities. Thus, a chief of party is designated within KAPP to handle internal coordination and project policy issues.

APPENDIX C

CONTRACT ADMINISTRATION

Working relationships with the U. S. Mission to Korea continued to be excellent. Program logistics, backstopping by the entire Mission, but especially by the Rural Development Office Director and the General Services Office is acknowledged with appreciation.

During the period of this report, intensive negotiations with the Office of Economic and Sector Planning, TAB/AID toward a revised Scope of Work, extension of the Project to 30 June 1976, and additional funding were completed. During the early part of this reporting period until the end of February, Amendment 8 to the Contract was in force, which allowed for continued minimal funding of four persons in Korea until 31 July 1975. Funds were not available for expenditures in East Lansing under Amendment 8 after 31 December 1975 until the negotiations for contract extension and additional funding were resolved in late February. This two-months' delay caused serious disruption of the campus-based activities and, over the period, made even short-range forward planning impossible. Fortunately, no personnel were lost to the project.

With the additional funding and extension until 30 June 1976, both campus and field staff are actively engaged in meeting the objectives of the contract and working towards a successful completion during the next year.

APPENDIX D

BUDGET

The provisions of Amendment 10 to Contract AID/csd-2975 has provided funding for the continuance of the project to 30 June 1976. This budget is currently scheduled to support a modified full campus and Korean based staff. It is currently planned that the Korean based staff will depart Seoul in March 1976, return to the campus and collaborate in the writing of the final report.

There is currently a proposal by the AID Mission in Korea to allocate an additional $9,600 to our contract to support computer services in Korea.

The budget as provided by Amendment 10 is:

Category	Approved Budget: Actual Expenditures From 7/1/71 To 12/31/74	Firm Budget From 1/1/75 To 6/30/76	Total From 7/1/71 To 6/30/76
Salaries	$497,369.00	$298,683.00	$ 796,052.00
Consultants	9,865.00	1,000.00	10,865.00
Fringe Benefits	62,446.00	44,802.00	107,248.00
Overhead	252,087.00	135,406.00	387,493.00
Travel	69,465.00	75,904.00	145,369.00
Equipment	750.00		750.00
Other Direct Costs	76,396.00	48,930.00	125,326.00
Allowances	10,430.00		10,430.00
Subcontract	10,277.00		10,277.00
TOTAL	$989,085.00	$604,725.00	$1.593.810.00

Recapitulation of Budget and Expenditures

Budget Schedule

Line Item	Total Budget 7/1/71 thru 6/30/76	Actual/Estimated Expenditures 7/1/71 thru 6/30/75	Actual/Estimated Expenditures 7/1/74 thru 6/30/75
Salaries	796,052	593,757	198,809
Consultants	10,865	4,685	1,420
Fringe Benefits	107,248	64,086	21,889
Indirect Costs	387,493	298,548	110,686
Travel	145,369	77,208	33,208
Equipment	750	750	
Other Direct Costs	125,326	78,361	16,226
Allowances	10,430	10,072	
Subcontracts	10,277	16,519	9,642
TOTALS	$1,593,810	$1,143,968	$391,880

Annual Expenditures from 6/30/71 thru 6/30/75

Line Item	6/30/71 thru 6/30/72	7/1/72 thru 6/30/73	7/1/73 thru 6/30/74	7/1/74 thru 6/30/75	Grand Total Expenditures
Salaries	61,154	144,312	189,482	198,809	593,757
Consultants	1,700	1,365	200	1,420	4,685
Fringe Benefits	5,024	15,446	21,727	21,889	64,086
Indirect Costs	32,442	71,291	84,129	110,686	298,548*
Travel	11,859	10,525	21,616	33,208	77,208
Equipment	478	272			750
Other Direct Costs	12,617	19,533	29,985	16,226	78,361
Allowances		7,677	2,395		10,072
Subcontracts		5,382	1,495	9,642	16,519
TOTALS	$125,274	$275,803	$351,029	$391,880	$1,143,986

The last annual report covers activities and related expenditures for period 6/30/71 thru 6/30/74. Other sections of the present report describe the activities during this reporting period.

The contract at this time is planning on and continuing to meet the objectives of the contract as specified in the plan of work.